

# Fossil Energy Research and Development

## Office of Fossil Energy

### Funding by Site by Program

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	\$ Change	% Change
<b>Chicago Operations Office</b>					
Ames National Laboratory					
Coal and Power Systems .....	487	500	480	-20	-4.0%
Total, Ames National Laboratory .....	487	500	480	-20	-4.0%
Argonne National Laboratory (East)					
Coal and Other Power Systems ....	3,885	3,582	2,802	-780	-21.7%
Natural Gas Technologies .....	298	210	0	-210	-100.0%
Total, Argonne National Laboratory (East) .....	4,183	3,792	2,802	-990	-26.1%
Brookhaven National Laboratory					
Coal and Other Power Systems ....	200	200	100	-100	-50.0%
Total, Brookhaven National Laboratory .....	200	200	100	-100	-50.0%
Total, Chicago Operations Office .....	4,870	4,492	3,382	-1,110	-24.7%
<b>Idaho Operations Office</b>					
Idaho National Engineering and Environmental Lab					
Coal and Other Power Systems ....	850	850	570	-280	-32.9%
Natural Gas Technologies .....	300	100	0	-100	-100.0%
Petroleum – Oil Technology .....	343	0	0	0	0.0%
Total, Idaho National Engineering and Environmental Lab.....	1,493	950	570	-380	-40.0%
Total, Idaho Operations Office.....	1,493	950	570	-380	-40.0%
<b>Livermore Site Office</b>					
Lawrence Livermore National Laboratory					
Coal and Other Power Systems ....	0	140	0	-140	-100.0%
Natural Gas Technologies .....	150	250	0	-250	-100.0%
Petroleum – Oil Technology .....	302	200	175	-25	-12.5%

**Fossil Energy Research and Development/  
Funding by Site**

**FY 2005 Congressional Budget**

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	\$ Change	% Change
Total, Lawrence Livermore National Laboratory .....	452	590	175	-415	-70.3%
Total, Livermore Site Office .....	452	590	175	-415	-70.3%
Los Alamos Site Office					
Los Alamos National Laboratory					
Coal and Other Power Systems ....	1,775	1,834	1,300	-534	-29.1%
Natural Gas Technologies .....	150	300	0	-300	-100.0%
Petroleum – Oil Technology .....	825	50	0	-50	-100.0%
Total, Los Alamos National Laboratory .....	2,750	2,184	1,300	-884	-40.4%
Total, Los Alamos Site Office .....	2,750	2,184	1,300	-884	-40.4%
National Energy Technology Laboratory					
National Energy Technology Laboratory					
Coal and Other Power Systems ....	358,414	394,973	416,089	+21,116	+5.3%
Natural Gas Technologies .....	40,959	37,336	24,385	-12,951	-34.6%
Petroleum – Oil Technology .....	36,040	31,804	14,550	-17,254	-54.2%
Program Direction and Management Support .....	68,452	79,196	78,851	-345	-0.4%
Plant and Capital Equipment .....	6,954	6,914	0	-6,914	-100.0%
Fossil Energy Environmental Restoration .....	8,569	8,401	5,242	-3,159	-37.6%
Cooperative Research and Development .....	3,965	4,177	1,480	-2,697	-64.5%
Advanced Metallurgical Research .....	5,961	9,876	8,000	-1,876	-18.9%
Total, National Energy Technology Laboratory .....	529,314	572,677	548,597	-24,080	-4.2%
NNSA Service Center					
Lawrence Berkeley National Laboratory					
Coal and Other Power Systems ....	200	580	100	-480	-82.7%
Natural Gas Technologies .....	1,250	850	300	-550	-64.7%
Petroleum – Oil Technology .....	500	200	125	-75	-37.5%

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	\$ Change	% Change
Total, Lawrence Berkeley National Laboratory .....	1,950	1,630	525	-1,105	-67.7%
Total, NNSA Service Center .....	1,950	1,630	525	-1,105	-67.7%
Oak Ridge Operations Office					
Oak Ridge National Laboratory					
Coal and Power Systems .....	5,488	6,089	4,580	-1,509	-24.7%
Natural Gas Technologies .....	260	510	0	-510	-100.0%
Petroleum – Oil Technology .....	640	0	0	0	0.0%
Total, Oak Ridge National Laboratory .....	6,388	6,599	4,580	-2,019	-30.5%
Total, Oak Ridge Operations Office.....	6,388	6,599	4,580	-2,019	-30.5%
Richland Operations Office					
Pacific Northwest Laboratory					
Coal and Power Systems .....	7,290	9,358	5,090	-4,268	-45.6%
Natural Gas Technologies .....	350	275	0	-275	-100.0%
Total, Pacific Northwest Laboratory ..	7,640	9,633	5,090	-4,543	-47.1%
Total, Richland Operations Office.....	7,640	9,633	5,090	-4,543	-47.1%
Sandia Site Office					
Sandia National Laboratories					
Coal and Power Systems .....	600	900	550	-350	-38.8%
Natural Gas Technologies .....	686	340	0	-340	-100.0%
Total, Sandia National Laboratories ..	1,286	1,240	550	-690	-55.6%
Total, Sandia Site Office .....	1,286	1,240	550	-690	-55.6%
Washington Headquarters					
Coal and Power Systems .....	21,433	31,478	38,339	+6,861	+21.7%
Natural Gas Technologies .....	1,457	2,823	1,315	-1,508	-53.4%
Petroleum – Oil Technology .....	2,333	2,824	150	-2,674	-94.6%
Program Direction and Management Support .....	18,777	27,029	27,149	+120	+0.4%
Fossil Energy Environmental Restoration .....	1,083	1,194	758	-436	-36.5%

Fossil Energy Research and Development/  
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FY 2005 Congressional Budget

(dollars in thousands)

	FY 2003	FY 2004	FY 2005	\$ Change	% Change
Import/Export Authorization .....	2,981	2,716	1,799	-917	-33.7%
National Academy of Sciences Program Review .....	497	494	0	-494	-100.0%
Cooperative Research and Development.....	4,005	4,218	1,520	-2,698	-63.9%
Energy Efficiency Science Initiative.....	2,440	0	0	0	0.0%
Total, Washington Headquarters.....	55,006	72,776	71,030	-1,746	-2.3%
Total, Fossil Energy Research and Development.....	611,149	672,771	635,799	-36,972	-5.4%

## Site Description

### Ames National Laboratory

The Ames National Laboratory is located in Ames, Iowa.

#### Coal and Other Power Systems

Ames National laboratory conducts advanced research on virtual simulations and high temperature materials.

### Argonne National Laboratory (East)

The Argonne National Laboratory (ANL), located in Argonne, Illinois, is a major multi-program laboratory managed and operated for the U.S. Department of Energy (DOE) by the University of Chicago under a performance-based contract.

#### Coal and Other Power Systems

Argonne research supports concepts for various technologies for Central Systems; supports DOE strategies to capture CO<sub>2</sub> from existing and advanced fossil fuel conversion systems in Sequestration R&D; supports DOE strategies to develop non-destructive testing examination of materials and mineral sequestration kinetics in the Advanced Research; and supports the DOE-SECA core technology program in Distributed Generation Systems.

#### Natural Gas Technologies

Argonne research for the Fossil Energy Natural Gas Technologies program in FY 2003 supported Drilling, Completion and Stimulation technology development and Environmental Science R&D. No activities are planned in FY 2004 and FY 2005.

## **Brookhaven National Laboratory**

The Brookhaven National Laboratory (BNL) is located on Long Island, New York.

### **Coal and Other Power Systems**

The Brookhaven National Laboratory conducts research on various technologies for central systems.

## **Idaho National Engineering and Environmental Laboratory**

The Idaho National Engineering and Environmental Laboratory (INEEL) is located outside of Idaho Falls, Idaho.

### **Coal and Other Power Systems**

Research conducted at INEEL supports concepts for various technologies for Central Systems; conducts research on breakthrough concepts to separate and capture CO<sub>2</sub> in Sequestration R&D; and conducts research and development on materials development and bio-processing research in Advanced Research.

### **Natural Gas Technologies**

Research conducted in FY 2003 supported environmental technology development, drilling technology and microbial analysis of gas hydrates, and small pipe development. In FY 2004 and FY 2005 no activity is planned.

### **Petroleum – Oil Technology**

Research conducted in FY 2003 supported microbial enhanced oil recovery (MEOR) and environmental research. In FY 2004 and FY 2005 no activity is planned.

## **Lawrence Berkeley National Laboratory**

The Lawrence Berkeley National Lab (LBNL) is located in Berkeley, California.

### **Coal and Other Power Systems**

The Lawrence Berkeley National Lab conducts research which supports concepts for various technologies for Central Systems; and conducts research and development on geologic sequestration approaches and measurement, monitoring, and verification protocols in Sequestration R&D.

### **Natural Gas Technologies**

Research conducted in FY 2003 and FY 2004 supported environmental analysis and modeling, heavy oil upgrading, reservoir characterization, and gas hydrates characterization. Some reservoir characterization activities will continue in FY 2005.

### **Petroleum – Oil Technology**

Research supports enhanced oil recovery (EOR) and environmental modeling.

## **Lawrence Livermore National Laboratory**

The Lawrence Livermore National Lab (LLNL) is located in Livermore, California.

**Fossil Energy Research and Development/  
Funding by Site**

**FY 2005 Congressional Budget**

### **Natural Gas Technologies**

Research conducted in FY 2003 supported environmental emissions analysis, reservoir geophysics, and hydrates properties, and hyperspectral remote leak detection. No activity is planned in FY 2004 or FY 2005.

### **Petroleum – Oil Technology**

Research supports environmental and reservoir modeling.

## **Los Alamos National Laboratory**

The Los Alamos National Laboratory (LANL) is located in Los Alamos, New Mexico.

### **Coal and Other Power Systems**

Research conducted by the Los Alamos National Laboratory supports concepts for various technologies for Central Systems; conducts research and development in the area of Sequestration R&D to lower the costs of CO<sub>2</sub> capture, provide fundamental scientific information on engineered terrestrial sequestration approaches, and develop advanced instrumentation to measure and validate terrestrially sequestered carbon; and conducts research and development in the area of Advanced Research to model mineral sequestration and develop hydrogen separation membranes.

### **Natural Gas Technologies**

Research conducted in FY 2003 supported multi-purpose energy meter. No activity is planned in FY 2004 or FY 2005.

### **Petroleum – Oil Technology**

Research conducted in FY 2003 supported seismic and drilling research. No activity is planned in FY 2004 or FY 2005.

## **National Energy Technology Laboratory**

The National Energy Technology Laboratory (NETL), located in Morgantown, West Virginia, Pittsburgh, Pennsylvania, and Tulsa, Oklahoma, is a multi-purpose laboratory, owned and operated by the U.S. Department of Energy. NETL conducts and implements science and technology development programs for the Department in energy and energy-related environmental systems. NETL's key functions are to shape, fund, and manage extramural (external ) RD&D projects, conduct on-site science and technology research, and support energy policy development and best business practices within the Department.

### **Coal and Other Power Systems**

Scientists and engineers at the National Energy Technology Laboratory (NETL) conduct basic and applied research and development in support of the Office of Coal and Power Systems programs. In-house research in the coal gasification area involves advanced materials testing; gas-stream pollutant removal; sorbents development; particulate removal; and membrane separations. NETL researchers are also working to improve the next generation of gas turbines, fuel cells, and coupled turbine-fuel cell systems. In-house emissions control research focuses on the problems of Hg and PM<sub>2.5</sub> because these will be regulated in the

relatively near future, while the by-product utilization in-house research solves environmental problems related to wastes and by-products formed during combustion processes. Research in carbon sequestration science studies the scientific basis for carbon sequestration options for large stationary sources of CO<sub>2</sub>. Finally, research in computational energy science is being conducted to utilize advanced simulation techniques to improve and speed the development of cleaner, more efficient energy devices and plants.

### **Natural Gas Technologies**

Within the Natural Gas Program, NETL has unique capability in hydrogen testing, computational chemistry, laser ignition development, and plastic pipe defect detection. With the exception of laser ignition development and plastic pipe defect detection, these functions will continue in FY 2004. Support for gas hydrates and natural gas resource assessment will continue in FY 2005.

### **Petroleum – Oil Technology**

Specific onsite expertise in enhanced oil recovery (EOR), environmental science, computational chemistry, and policy analysis supports the Oil Technology Program.

### **Program Direction and Management Support**

This activity provides funding for salaries, benefits and overhead expenses for management of the Fossil Energy (FE) program at the National Energy Technology Laboratory (NETL), with sites in Morgantown, WV, Pittsburgh, PA, and Tulsa, OK.

### **Plant and Capital Equipment**

This activity provides funding for general plant projects at the National Energy Technology Laboratory (NETL), with sites in Morgantown, WV, Pittsburgh, PA, and Tulsa, OK; and the Albany Research Center. Funding is also included for the 7-year project for construction, renovation, furnishing, and demolition or removal of buildings at NETL facilities in Morgantown, West Virginia, and Pittsburgh, Pennsylvania.

### **Fossil Energy Environmental Restoration**

Activities are to ensure protection of workers, the public, and the environment in performing the mission of the National Energy Technology Laboratory (NETL) at the Morgantown, West Virginia, Pittsburgh, Pennsylvania, and Tulsa, Oklahoma sites, and the Albany Research Center at Albany, Oregon.

## **Oak Ridge National Laboratory**

The Oak Ridge National Laboratory (ORNL) is located in Oak Ridge, Tennessee.

### **Coal and Other Power Systems**

The Oak Ridge National Laboratory conducts research on advanced materials that are applicable to advanced coal based power generation systems such as Vision 21 in Central Systems; conducts research and development in the area of Sequestration R&D to further geologic sequestration concepts, including measurement, monitoring and verification, and to understand the important soil parameters that facilitate terrestrial sequestration; and conducts research and development in the area of Advanced Research to develop materials and perform bio-processing research.

### **Natural Gas Technologies**

Research conducted in FY 2003 supported oil processing environmental mitigation technologies and characterization of gas hydrates. ORNL has unique capabilities in petroleum product physical measurements, and EMAT sensor development. No specific activities are planned in FY 2004 or FY 2005.

## **Pacific Northwest Laboratory**

The Pacific Northwest Laboratory (PNNL) is located in Richland, Washington.

### **Coal and Other Power Systems**

The Pacific Northwest Laboratory conducts research and development in the area of Advanced Research to perform materials research and environmental analyses; and conducts research and development in the area of Distributed Generation Systems in support of the DOE-SECA program.

### **Natural Gas Technologies**

Research conducted in FY 2003 supported reservoir geophysics, hydrate characterization, and ultrasonic strain detection. No activity is planned in FY 2004 or FY 2005.

## **Sandia National Laboratories**

The Sandia National Laboratory (SNL) is located in Albuquerque, New Mexico, and Livermore, California.

### **Coal and Other Power Systems**

The Sandia National Laboratories conducts research and development in the area of Sequestration R&D on injection of CO<sub>2</sub> into depleted oil and gas formations, and advanced monitoring methodologies based on advances seismic concepts; and conducts research and development in the area of Advanced Research to develop hydrogen separation membranes and conduct fundamental combustion research.

### **Natural Gas Technologies**

Research conducted in FY 2003 supported air emissions detection, measurement while drilling technology, reservoir geomechanical analysis, and airborne leak detection. No activity is planned in FY 2004 or FY 2005.

## **Washington Headquarters**

### **Coal and Other Power Systems**

This funding provides program support and technical support for each of the program within the Coal and Other Power Systems Program.

### **Natural Gas Technologies**

The funding provides program support and technical support.

### **Petroleum – Oil Technology**

The funding provides program support and technical support.

**Program Direction and Management Support**

This activity provides funding for salaries, benefits and overhead expenses for management of the Fossil Energy (FE) program at Headquarters.

**Fossil Energy Environmental Restoration**

The funding provides program support and technical support.

**Import/Export Authorization**

The Office of Import/Export Authorization manages the regulatory review of natural gas imports and exports, exports of electricity, and the construction and operation of electric transmission lines which cross U.S. international borders.

**National Academy of Sciences Program Review**

This program provide for a study, in FY 2003, by the National Research Council (NRC) of prospective future benefits of Fossil Energy R&D.

**Cooperative Research and Development**

The funding provides program support and technical support.

**Other****Coal and Other Power Systems**

- The Clean Coal Power Initiative subprogram funds research at major performers at non-DOE locations. Examples of these performers include Otter Tail Power Corp. with UNDEERC and W. L. Gore & Associates, Tampa Electric, Universal Aggregates, LLC., Sunflower Electric Power Corp., CONSOL Energy, Inc., TIAX, LLC., JEA, Air Products Liquid Phase Conversion Co., and Kentucky Pioneer Energy, Ltd. with Fuel Cell Energy and Global Energy.
- The Central Systems subprogram funds research at major performers at non-DOE locations. An example of these performers include the Albany Research Center focusing on various advanced materials and process-related concepts.
- The Sequestration R&D subprogram funds research at major performers at non-DOE locations. Examples of these performers include the CO<sub>2</sub> Capture Project (CCP), a collaborative effort involving nine major international energy companies, that has the goal of developing advanced technologies to significantly (75%) reduce the costs of capturing CO<sub>2</sub> from fossil fuel energy systems, an advanced fossil fuel conversion process with inherent CO<sub>2</sub> capture (Alstom), development of a combined membrane-fossil fuel combustion system that would produce a pure stream of CO<sub>2</sub> for sequestration (Praxair), and testing a regenerable sorbent system capable of capturing CO<sub>2</sub> from advanced coal gasification systems (RTI). The Sequestration R&D subprogram also funds research at major colleges and universities—developing an accurate cost and performance model for CO<sub>2</sub> capture systems (CMU); using hardwoods to restore mine lands (University of Kentucky); developing a carbon management geographic information system (MIT)—and at non-governmental organizations such as the Nature Conservancy who is developing a carbon accounting system for large forest ecosystems.

- The Fuels subprogram funds research at major performers at non-DOE locations. Examples of these performers include APCI, Texaco and Praxair.
- The Advanced Research subprogram funds research at major performers at non-DOE locations. An example of these performers include, the Albany Research Center which conducts research on materials and mineralization sequestration processes.
- The Distributed Generation Systems subprogram funds research at major performers at non-DOE locations. Examples of these performers include the SECA industry teams and SECA core technology teams.

### **Natural Gas Technologies**

The Department's Natural Gas Technologies program, within the Fossil Energy and Development program, funds research at major performers at non-DOE locations. Examples of these performers include partnerships with industry, universities, national laboratories, state and local governments, and other organizations. Private sector participation is emphasized through industry cost-sharing with individual companies and consortia to ensure market relevance and to facilitate the transfer of technology to the private sector while leveraging Federal R&D investment. University research supported by this program contributes to U.S. technological leadership.

### **Petroleum – Oil Technology**

The Department's Oil Technology program, within the Fossil Energy and Development program, funds research at major performers at non-DOE locations. Examples of these performers include partnerships with industry, universities, state and local governments, and other organizations. Private sector participation is emphasized through industry cost-sharing with individual companies and consortia to ensure market relevance and to facilitate the transfer of technology to the private sector while leveraging Federal R&D investment.

### **Fossil Energy Environmental Restoration**

Activities include environmental protection, and cleanup activities at several former off-site research and development locations.

### **Advanced Metallurgical Processes**

The Advanced Metallurgical Processes program conducts inquiries, technological investigations, and research concerning the extraction, processing, use, and disposal of mineral substances under the mineral and materials science program at the Albany Research Center in Oregon.

### **Cooperative Research and Development**

Provides the federal share of support for Jointly Sponsored Research Programs (JSRP) at the Western Research Institute (WRI) and the University of North Dakota Energy and Environmental Research Center (UNDEERC).